



Osseo-intergrated Retention for Extraoral Maxillofacial Prosthesis

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ABSTRACT

The fabrication of facial prosthesis is much an art as it is science. Prosthesis form, coloration, and texture must be as indiscernible as possible from the surrounding natural tissues. The ideally constructed prosthesis must duplicate the missing facial features so precisely that the casual observer notices nothing that would draw attention to prosthetic reconstruction. Osseo integrated implants have been shown to be the most useful asset in the retention, stability and support when compared to other conventional prosthesis. Through, this paper focus is placed on placement of implant for retention of maxillofacial prosthesis.

KEYWORDS : osseointegration, implants, maxillofacial defect

Introduction

Success of rehabilitation efforts can only be judged, when patients can appear in public without fear of attracting unwanted attention. Body abnormalities or defects that compromise appearance, function, and accommodation sufficient to render an individual incapable of leading a relatively normal life have usually prompted responses that seek to bring the person to a state of acceptable normality. In response to congenital or acquired defects man has continually sought to cope with his debilities by using his genius and the material resources available for restoration.

“Maxillofacial prosthodontics” is concerned with the restoration and / or replacement of the stomatognathic and craniofacial structures with prostheses that may or may not be removed on a regular or elective basis.¹

However, appropriate retention, stability and support must be provided to the prosthesis if successful results are to be achieved. Osseo integrated implants have been shown to be the most useful asset in the retention, stability and support when compared to other conventional prosthesis. Through, this paper focus is placed on placement of implant for retention of maxillofacial prosthesis.

Role of Osseointegration in Maxillofacial Prosthesis:

The restoration of maxillofacial defects has significantly improved with the development of new materials and advances in clinical, surgical and laboratory techniques. These advances specifically the use of endosseous implants have improved retention, stability and esthetics, resulting in more natural appearing and functioning prosthesis.

The osseointegration is described as a “direct structural and functional connection between ordered, living bone and the surface of a load-carrying implant”.

Titanium retention elements have been integrated in the bone tissue close to the defect, thus providing anchorage for the prosthesis through mechanical or magnetic retention. Bone in the temporal, orbital and mid-face regions is seldom adequate for placement of implants designed for maxillofacial use.

The craniofacial implants are fabricated of commercially pure titani-

um and they are short about 3-5mm in length and possess a platform that is about 5mm in diameter. The flange increases implant surface area in contact with the bone. Also the perforations in the flange add additional surface area provide mechanical stabilization and prevents undue penetration into the inferior compartment.²

A two stage surgical procedure, basically the same as that used in the intraoral application is employed. Surgical placement can be conducted with local anesthesia. The implant sites are prepared and tapped in the usual manner.

Implant Retained Prosthesis Versus Adhesive Retained Maxillofacial Prosthesis:

The major development in recent years has been the use of osseointegrated implants for retention. The use of osseointegrated implants is destined to have dramatic impact on restoration of facial defects. The retention and support derived from these implants eliminates some of the primary limitations of adhesive retained facial restorations. These include-Improved retention and stability of the prosthesis, Elimination of occasional skin reaction to adhesives., Ease and advanced accuracy of prosthesis placement, Improved skin hygiene and patient comfort.³ Decreased daily maintenance associated with removal and reapplication of skin adhesives, Increased life span of the facial restoration when skin adhesives are used for retention, they must be removed reapplied daily, leading to loss of colourants at the margin of the prosthesis and Enhanced lines of juncture between the prosthesis and skin when an implant-retained prosthesis is fabricated, also its margins can be made thinner and developed with the prosthesis positive pressure.⁴

Disadvantages of Adhesives used in the Retention of Maxillofacial Prosthesis:

They includes-The adhesive retained prosthesis requires daily removal of the adhesive, which may damage the extrinsic colors of the facial surface and may eventually result in margin loss, Adhesives tend to damage prosthesis margin gradually with daily use and may tend to loose adhesive bond if perspiration present, Adhesives will leads to an allergic skin reaction if used for longer time and also silicon adhesives require silicone solvent for cleaning, which may cause deterioration of base material.⁵

Reconstruction of Orbital Defects:

Implants in orbital defects reduces the need for adhesives and enables easy application and removal of the prosthesis.

Problems associated with adhesives in the temporal region are more prevalent in the orbit. The blind duct characteristics of an orbital defect combined with the margin sealing using adhesives enhance moisture accumulation behind the prosthesis. Chronic moisture accumulation on the skin is characterized by marked inflammation, affecting the health of soft tissues. This inflammation may cause discomfort and adversely affects the fit and esthetic quality of the prosthesis. Extra oral implants can provide support and retention for orbital prosthesis, that are far superior to those achieved with skin adhesives.⁶⁻⁸

For an orbital prosthesis, the implants are ideally placed around the defect within the orbital rim. Because of the bone anatomy placement is often limited to the superior and lateral aspects of the rim. The implants should be placed within the confines of the defect and parallel or slightly inward in relation to the frontal plane, so as not to interfere with the ideal contours of the prosthesis. In more extensive orbital defects, implants can be placed in the zygoma or maxilla.

Various Retention Options:

In the orbital defects basically five retention options used: Bar end clips, Bar and magnets, Individual magnets, Ball attachments or Combination of these.

Bar Construction with Retentive Clips:

A bar construction is a wire soldered to the gold cylinders and mounted onto the abutments by gold screws. Retentive clips are placed on the inner aspect of the acrylic plate, providing a rigid and secure position for the prosthesis. This type of construction provides good retention for large defects that has implants only in the upper orbital rim to support the prosthesis.⁹

Individual Magnets:

The individual retention system consists of a magnet cap that is threaded onto the abutment and a magnet placed into the fitting side of the prosthesis. In an orbital defect with implants in the upper and lower orbital rim the individual magnet system is recommended. This type is especially recommended when there is shallow defect with insufficient space for a bar and clip construction.

Its Advantages are—Easy for patients to maintain good hygiene around the abutments and Easy to put on and take off the prosthesis.¹⁰

Ball Attachments:

When there is shallow defect, the ball attachments are one opinion of retention because they occupy little space behind the prosthesis. Three implants creating tripod are imperative to provide satisfactory retention and stability.

Console Abutment:

In cases with small closed defects where two implants are inserted in the upper rim and one exists in the lower orbital rim and where the directions of implants are at difficult to angles to each other, prosthetic abutment options are improved by the use of a console abutment. This device can alter the angle of one fixture relative to another thereby facilitating prosthesis attachment.¹¹

Implant Designs used in Reconstruction of Nasal Defects:

Nasomaxillary or Nasolabial defects cause functional and esthetic problems, which may require load-bearing capability by the fixture sites especially lip forces dislodge the prosthesis. Implants to anchor a nasal prosthesis can be placed in the maxillary and frontal bones. The placement of implants should be within the confines of the outer contours of the prosthesis. Location of the frontal sinuses and the superior margin of the prosthesis are limiting factors in the placement of implants in the superior aspect of the defect. If the implants are placed within the inferior aspect of the defect, care must be taken so that access is available for retentive components.

Implant Designs used in the Reconstruction of Auricular Defects:

For an auricular prosthesis, implants are placed in the post-auricular region. This area corresponds to the location of helix and antihelix. Some authors described that the location of implants should be 18-20mm from the center of the external auditory meatus.

For an auricular prosthesis, two to three implants are normally sufficient for satisfactory retention and the ideal position is approximately 20mm from the center of the external auditory canal. This position will help in the construction of bar in proper contour with antihelix ridge to enable the anaplastologist to make a prosthesis that is deep enough to produce a good cosmetic result.¹²

Retention Systems or Attachments:

Two retention systems are used separately or combined. These are—Use of a gold alloy bar approximately 2mm in diameter, which is soldered to the gold cylinders and attached to the abutments. Retention clips are incorporated into the prosthesis providing attachment to the bar and retention technique by use of magnets.

Gold alloy bars may be fabricated to retain the magnets, which are connected to the abutments. Magnets are commonly 6mm in diameter and 2mm in thickness. The bar structure must be designed to contain housing to hold magnets, which are sealed into acrylic resin.¹³

Implant Designs used in the Reconstruction of Midface Defects:

Midface defects often result from ablative procedures used to control malignancies of nasal and maxillary structures. The surgeries may produce a small soft tissue defect or a massive defect involving intraoral and extraoral structures. As the size of the defect expands to involve the intraoral structures, the muscles of facial expression, and the muscles of mastication, the complexity of the prosthetic rehabilitation increases.

Defects which involve palatal and extraoral structures are frequently retained by connecting the intraoral and extraoral prosthesis together. This process involves the use of adhesives combined with the magnetic retention between the two prosthesis. This technique enhances retention for the facial prosthesis but may adversely affect its stability. Movement of the intraoral prosthesis is transferred to the facial prosthesis producing a noticeable and unnatural appearance. Removal of either prosthesis may adversely affect the retention of other requiring it also to be removed. As with orbital and auricular prosthesis, rehabilitation in the midface region with the endosseous implants will enhance retention, stability and esthetic of the prosthesis.¹⁴

Described available sites for implant placement in the midfacial region, and they suggested a craniofacial site classification for osseointegrated implants.

Alpha sites: These are 6mm or greater in axial bone volume available for dental implants. The most common areas of the facial skeleton having that much bone available are the anterior maxilla through the nasal fossa and the zygoma and the zygomatic arch and the lateral periorbital region.¹⁵⁻¹⁷

Beta sites: These will have 4 to 5 mm of bone available permitting the use of 4mm craniofacial implant. These areas are superior, lateral and inferolateral orbital rims as well as much of the temporal bone and zygoma.

Delta sites: These are marginal sites with 3mm or less of bone volume available. Locations in the infraorbital rim, temporal bone, pyriform rim, zygomatic buttress nasal bone, and zygomatic arch require the use of 3mm craniofacial implants.

Implant Design Considerations in Maxillectomy Defects:

Most tumors requiring maxillary resection arise either from the paranasal sinus or palatal epithelium or from the minor salivary glands present in the submucosa. Resection of these tumors requires either a radical or a total maxillectomy.

Prosthetic rehabilitation in maxillectomy should not only provide closure between the oral and nasal cavity but also substitute for teeth and support for the upper lip and the anterior soft tissues of the face. Since most of the skeletal components for anchorage have been re-

moved at surgery and the anchorage should be obtained from zygoma and in the pterygoid region.¹⁸

Implant Design Considerations Mandibular Defects:

The management of malignant tumors associated with the tongue, the mandible and adjacent structures represent a challenge for the surgeon and prosthodontist, with respect to control of the primary disease and rehabilitation after the treatment. The most common intraoral sites for squamous cell carcinoma are the lateral margin of the tongue and floor of the mouth. Both locations predispose the mandible to the invasion of tumor, often necessitating its resection along with large portions of the tongue, the floor of the mouth, and the regional lymphatics.¹⁹⁻²⁰

Conclusion:

The maxillofacial prosthesis currently available still do not meet patient needs. The possibility of fabricating high quality life like prosthesis on the facial region would require a perfect material comprising of all the required properties of an ideal material. The highly successful results have been obtained with the implant retained maxillofacial prosthesis. The use of osseointegration in maxillofacial prosthodontics overcomes the many limitations associated with conventional prosthesis. This will continue a revolution in maxillofacial rehabilitation.

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